TRB

AT045

Intermodal Freight Transport

Transportation Research Board (TRB) of the National Academies

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COMMENTS FROM THE COMMITTEE CHAIR

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Greetings Intermodal Freight fans!!

I hope your summer season has started off with good and happy events. Here we are with another issue of the Blue Ribbon winning TRB AT045 Intermodal Freight Transport Committee's newsletter. We have an interesting international story on the importance of flexibility in the face of unplanned disruption to the intermodal freight chain. I think you'll find that the key to this flexibility is a network of people. One would think that the important thing is the development of interoperable software… or the development of integrated technologies that can facilitate modal shifts on a near real-time basis... or the new communication technology that can overcome jurisdictional border standards and provide seamless connectivity. From where I sit, each one of these scenarios are good but none of them are possible without a network of people that can work together, that have developed trusting relationships, and can see the benefits of working together to achieve a common goal. When someone has an unexpected problem (a road or train track is flooded, a crash has closed a roadway for an extended period-of-time, etc.), nothing works better than knowing that the person that can help solve the problem is willing to answer the call for assistance and move into action. Not all intermodal challenges can be solved with a mode shift. Not all intermodal challenges can be solved with smarter technology. Sometimes, a challenge can best be addressed the old-fashioned way – roadway restrictions are temporarily lifted, a detour is created for trucks only, a road is closed that has an at-grade railroad crossing to allow for increased rerouted train traffic. Our intermodal freight research must look at software integration solutions, innovative technology solutions, and it also must go 'old school' and include old fashioned institutional 'people' solutions. Nothing gets done without people getting on the same page – first.

This issue also looks at yet another hallmark achievement of the AT045 committee – elevating and rewarding private sector driven research. We acknowledged and celebrated another award winning private sector research paper at the 2018 TRB Annual Meeting. See the article in this newsletter for more details on Sadie Smith's paper on transload facilities.

In closing, I'd like for everyone reading this newsletter to begin thinking about conducting research on intermodal freight on a global, comprehensive basis. That means from the product order to manufacturing to truck to plane/ocean going vessel to train to truck to car or bicycle all the way to the end user - to include air quality issues, fuel prices, public policy inhibitors, traffic laws, parking, etc. That's a very tall order – but we're a very sharp group of professionals with a network that is AMAZING! If anyone can do this, our community can – I just know it!

INTERMODAL FREIGHT TRANSPORT NETWORKS UNDER UNCERTAINTY: EXAMPLES IN/FROM MAIN PORTS IN THE NETHERLANDS

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In the Netherlands, the main port Rotterdam, is confronted with a steady growth in total volume, mostly resulting in a direct increase of the road transport; the resulting road congestion led to various initiatives increasing the share of transport over water and rail. Overall, this intermodal situation is vulnerable to many sources of uncertainty, ranging from relatively common, low impact events, to relatively rare, high impact events.

For instance, a major disruption on the railway link around Rastatt, in Germany, some 600 km upstream the Rhine valley, on the main freight corridor to Switzerland and Italy, caused large problems in summer 2017 and almost 12 million euros losses per week. The freight route, roughly used by 200 freight trains a day, was completely unavailable for almost 2 months, and moreover there were extremely limited diversion routes. The reaction to this disruption, can be categorized along the three axes software, hardware, orgware (see, e.g., Corman Negenborn 2018) as:

- on the **hardware** side (i.e., the bare infrastructure), to put in place round the clock shifts, to repair as quickly as possible the disrupted location;
- on the **software** side (optimizing the flow to avoid bottlenecks and maximizing the utilization of the network), to choose alternative paths or destination when possible;
- on the **orgware** side (organizations aspects, when and where which goods can be transported) an impressive collaboration of multiple train operators was required in three different countries, to allow capacity on minor or side corridors to take some of the diverted freight traffic.

Also the water transport faces disruptions, including inland vessels transporting containers between large sea ports and hinterlands. About 77,000 such inland vessels moored in the port of Rotterdam in 2014, often facing long waiting times, and limited possibility to update loading/unloading schedules. New advanced, automated planning systems can instead optimize the routes and visiting sequences of inland vessels to terminals in a more efficient way (S. Li and Negenborn, 2018)

The ultimate goal would be to consider integrated road, rail and waterway infrastructures to deliver the best transport performance under uncertain circumstances. Concepts such as synchromodal transport stimulate this direction (see, e.g., van Riessen et al, 2015). This requires dealing with complex optimization problem, limited information due to time or privacy issues , and decisional power spread over many stakeholders (See L. Li et al , 2017). Overall, single modes might be unreliable, but their coordination, under some intelligent management spanning software and orgware, is not.

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Our committee's focus on the private sector is unique at TRB. While most concentrate on the public sector, the Intermodal Freight Transport committee is focused on providing private sector solutions that impact the global supply chain.

As such, the committee has strived to align our work with this unique mission. Most recently, the committee launched an annual award to acknowledge and induce research that is directly applicable to the private sector intermodal community.

To support this year's fourth annual award, the committee released two calls for papers. The first a traditional call, with the second call for papers focused on attracting research applicable to the private sector. After the committee completed the traditional review process, the executive committee shortlisted three papers for consideration. The winner was then selected by a group of committee members and friends.

The committee overwhelmingly chose Sadie Smith's paper on the "Development of a Cost Estimation Framework for Potential Transload Facilities," as the 2018 Private Sector Applicability award winner.

As transportation cost competitiveness continues to increase, transload facilities are often developed to capitalize on multimodal efficiencies and resiliency. While the benefits are clear and quantifiable, there is not a defined methodology to estimate the cost of proposed transload facilities.

Smith's paper outlined a thorough, yet understandable methodology to determine the basic cost of transload facilities by type using unit costs from a construction cost database, equipment costs from local dealers, the projected commodity tonnage, design recommendations from literature, and survey responses from local facilities.

Sarah Hernandez, PhD and Sadie Smith are presented with the Private Sector Paper Award by Committee Vice-Chair Jolene Hayes and Dan Haake.

During our committee's annual meeting, Smith gave a well-received presentation on her paper and potential implications for the private sector.

Following her presentation, Committee Vice Chair Jolene Hayes presented Smith and her faculty advisor Sarah Hernandez, PhD with the 2018 Private Sector Applicability award.

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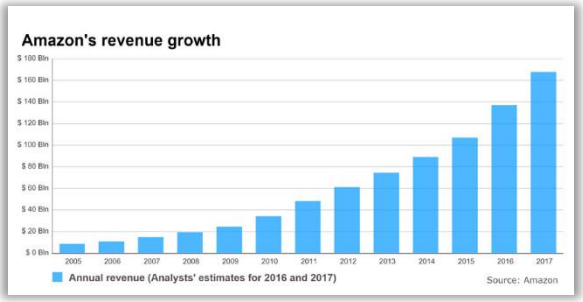
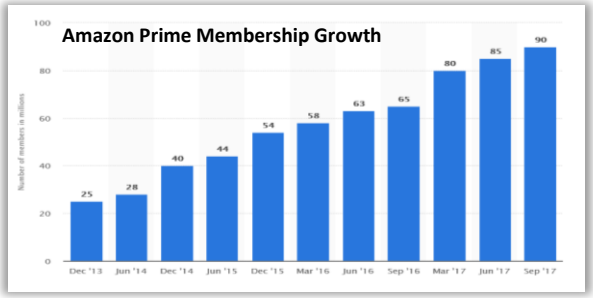
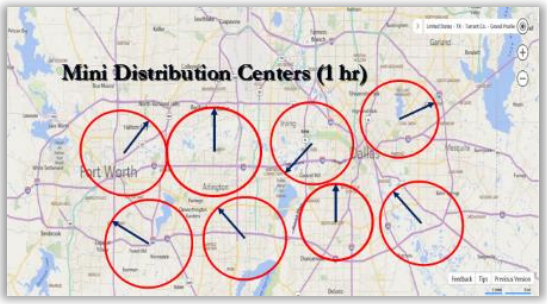
Technology for freight is changing things for the better – but technology isn't only making long haul moves better, it's making a C-Change in consumerism worldwide. I'll tell you a story that may not seem like it's connected to freight movement but if we open our eyes, we'll see that it not only greatly impacts freight, it makes our strides in freight technology research seem pretty lacking for a major issue facing the freight delivery domain today. Let's start with some facts about only one of many companies and initiatives emerging all around us. Most of us have heard of Amazon.com and Amazon Prime. Amazon has grown with its 'click, click, click – ding dong delivery to your door service' by leaps and bounds. Revenue growth has been astounding and Amazon Prime membership has exploded in just the past five years. What, you may ask, does this have to do with freight movement research? Let's dig a little deeper… There are now close to 80 million Amazon Prime members that are eligible for same day delivery of their goods - FOR FREE!! How many of us have made purchases (Amazon or otherwise) over the internet and had our goods delivered to just about any address we desired? Yes, most of us. When we look up and outside of our air - steamship - train - truck domain, we can begin to see companies (DHL and Audi) offering services that allow goods to be delivered directly to the trunk of your car – whether it's in a surface lot, in a parking garage, or parked curbside or even in a driveway. Still other technologies are facilitating delivery of goods and services not only directly to your home address but also placing them directly inside your home when delivered. Not left on your porch… but inside your home utilizing technologies that allow the delivery company to use a code to unlock your front door or to open your garage and leave your parcel safely in your home, apartment or garage.







To make technology matters and freight even more interesting, you are starting to see a surge in online purchase deliveries guaranteed in just one hour or less. If you think about delivering goods in one hour or less and how long it takes you to get

home from work during rush hour, you KNOW that there's no way to make 30 or more deliveries in less than one hour with one vehicle from a warehouse located outside of town. Thinking deeper, you will come to realize that in order to make such a guarantee, a company would have to use many smaller vehicles and also create a network of 'mini-distribution' centers throughout an urban area. To be delivered in one hour means it would have to come from a location fairly close by.

In addition to the rapid rise in freight deliveries on our already congested, parking constrained streets, food delivery is becoming more prevalent. Amazon has purchased Whole Foods Markets with the realization that consumers can get the freshest, healthiest foods and have them delivered to the consumer's doorstep via the Amazon delivery system. Business enterprises like UberEats, GrubHub, DoorDash, etc. are rapidly responding to consumer desires to have restaurant food delivered quickly and inexpensively. These food delivery companies are strategically placing themselves in relationships that will allow for rapid growth, quick delivery, and loyal customers.

What does this have to do with freight research and why should I be concerned or care?

The technology advancements that allow all of us to get our big screen TV or our printer cartridges or that new Fitbit watch the same day (or heaven forbid we have to wait TWO days) with just a few clicks does not happen without parking. Each and every delivery vehicle has to park. Maybe for a period of 90 seconds or maybe for 5 minutes but almost always right at the location of delivery (or pickup) – and not at the open space two blocks away or the garage around the block. The next time you go outside, take a look and you'll be surprised at how many delivery vehicles you suddenly notice – all around you. Listen and look for the offers for free delivery. It doesn't matter if it's a new computer or some milk and eggs from the grocery store or that delicious order of Chicken Piccata from the Italian restaurant on 23rd Street, they are all responding to our demands and will find or 'make' a parking space to ensure our deliveries are on time.

Let me ask those of you that think parking is not an intermodal freight problem… Do our technology innovations address the freight delivery challenges that require vehicles to stop and park in front of the building where the lady in Apt. 15C is waiting for her piping hot dish of Chicken Lo Mein? Do they help the delivery vehicle that has six minutes left before the 1 hour delivery guarantee is exceeded? (that would be the new projector replacement lamp Mr. Johnson in office suite 3F paid extra for in order to secure the big contract) Unfortunately, today's parking technology systems will not provide any relief for these types of freight deliveries.

Today, the highly innovative technologies we are deploying in the parking industry do amazing things but they do little to nothing for the delivery vehicles that are crowding and blocking lanes because we (you and me) are ordering our goods online without regard to how they get delivered, where the delivery vehicles must park, or what congestion issues are caused. We are mostly concerned that the delivery is made when we want it, where we want it and it had better not be

late. Meeting these challenges takes a large toll on the freight delivery systems that are evolving to accommodate consumer demands. Unfortunately, we all pay for that with dangerous parking scenarios (blocking roadway lanes, blocking bicycle lanes, blocking sidewalk/pedestrian access, etc.), all while the troublesome congestion problems increase.

Delivery Vehicles and Drivers Look Nothing Like They Used To…

Our perceptions of what the delivery person and the delivery vehicles look like are probably outdated for most of us. The delivery person pictured here delivers groceries as well as goods from Target and Walmart and other stores that people purchase online and expect their deliveries within two hours. Naomi, the nice delivery woman pictured here, pulled up to our home and I had no idea that she was delivering our food contributions we ordered for a church function from the Wegmans grocery store. She works only in the evenings on a part-time basis for extra money because she dislikes the daytime congestion and lack of parking space availability, however, many of her peers work during the day.

The types of vehicles shown in the collage below are only a small sample of delivery vehicles that are making all types of deliveries from dining room tables to sushi and everything in between.

Many cities provide loading zone spaces but they are inadequate for the types of deliveries that are on the rise. Unfortunately, even if there was a dedicated loading zone at each and every location that is needed (which there isn't), too often the spaces are taken by automobiles that are not making deliveries – or there is another delivery vehicle in the spot already. Many years ago in the early '90s, a senior executive from UPS confided to me that in one city alone, UPS pays more than $1 million in citation fees, but due to lack of parking availability they must consider

those fees a ‘cost of doing business’. Today, there is much more freight delivery traffic with little to no increase in parking spaces/loading zones. Because of my work in transportation technology, I became keenly aware of the problem facing delivery companies and the costs associated with citations and towed vehicle recoveries. There are solutions! But they aren’t easy.

In addition to an increased demand for goods delivery, there has been an increase in demand for bicycle lanes as well as dedicated transit lanes. These demands are growing while the increasing and unmet demands for space to make goods delivery are decreasing. A recipe for a collision that will have to be addressed. There’s a thought that in order to come up with good answers, you must first ask good questions. The challenge facing freight delivery parking challenges must first be recognized and understood by those of us in the intermodal freight research arena before we can begin to find innovative solutions that work and benefit our organizations, our customers, and the general public.

Real Solutions Exist

The issue of freight and parking availability is a complex one. The solutions involve many stakeholders. One would be hard pressed to find someone that likes to see freight delivery vehicles on their roadways and conversely, practically no one is willing to sacrifice or be denied the convenience of having their goods delivered to their home or place of employment. Bicycle lanes are important. Transit lanes are important. Unblocked sidewalks are important. Parking regulations are important. Yet all these stakeholders think that THEIR freight deliveries are important. The key to real solutions start with education and awareness. Yes, parking and intermodal freight are connected. Look around… look at the UberEats or GrubHub advertisement at your favorite restaurants… look at the delivery options on your favorite online shopping website. If you look, you’ll see this issue all around you and some of us may even wonder how we didn’t see it before. When that happens, we’ll have reached the first step in addressing this ever worsening collision between freight and parking.

It is my hope that we continue, as an industry, to embrace technologies that make sense, that move us forward, that are cost feasible and improve lives. It is also important that we take our place in the broader transportation environment and recognize our role in solving some major challenges. As intermodal freight transport researchers - we can do this!!

EPA and Port Everglades Partnership Report Released

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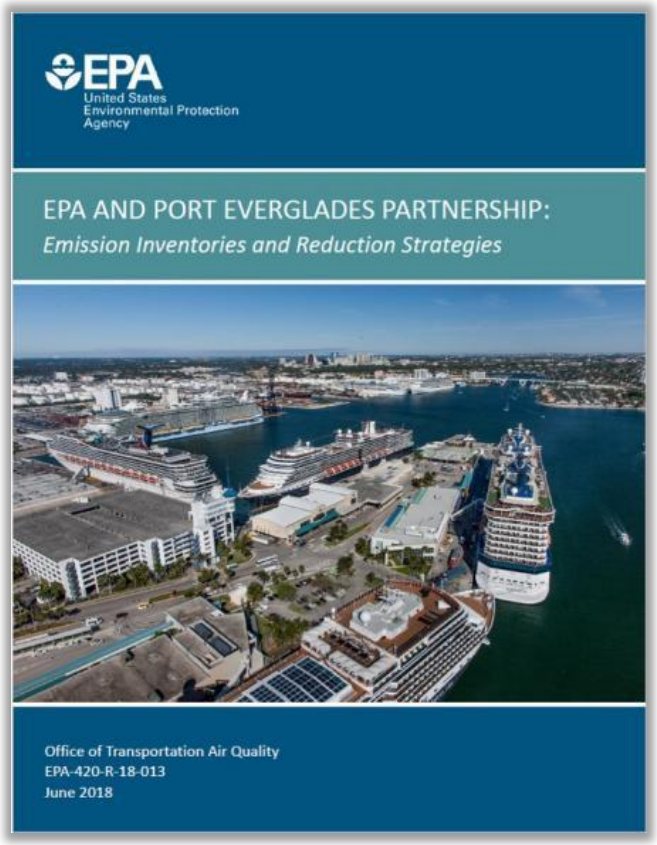
We have exciting news from the U.S. EPA's Ports Initiative that may be of interest to the TRB Freight Systems Group. (…) The EPA and Broward County's Port Everglades in Florida released a first-of-its-kind collaborative report titled "EPA and Port Everglades Partnership: Emission Inventories and Reduction Strategies." The report describes how EPA and the Port developed baseline and future year emission inventories for nitrogen oxides (NOx), particulate matter (PM), and other harmful pollutants that result from typical port operations. In addition, the report evaluates the potential emissions reduction benefits of deploying cleaner technologies and more efficient operational strategies. For example, at Port Everglades, the potential of replacing older harbor craft engines with cleaner diesel engines could result in a 15–25 percent reduction in PM emissions in 2025, while replacing older cargo handling equipment with advanced technologies or alternative fuels could reduce NOx emissions by 21–76 percent in 2035. Through this effort, EPA also developed a separate modeling analysis of potential strategies for reducing emissions in transportation corridors outside of the Port. In addition, this effort will inform EPA's future update of its Port Emissions Inventory Guidance.



We will be scheduling a public webinar this summer to discuss this work in further detail. Until then, for more information on the EPA and Port Everglades Partnership and to access the executive summary and report, visit www.epa.gov/ports-initiative/epa-and-port-everglades-partnership-emission-inventories-and-reduction-strategies.

For more information on Port Everglades, visit www.porteverglades.net.

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The scope of the TRB AT045 Intermodal Freight Transport committee includes all aspects of research pertaining to intermodal freight transport. Attention has traditionally been given to rail-water, rail-highway, highway-water, and highway-air modal combinations, but other combinations are also of interest. As used here, intermodal freight transport includes all shipments that employ more than one mode in a single through movement from origin to destination. Consideration of rates, routes, services, transfer facilities, containers, and other items that impact the movement of freight in intermodal transport are included.

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TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

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AT045 Intermodal Freight Transport

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